

SOLUTION FINAL EXAM

PROBLEM 1

$$q = \frac{K}{2L}(h_1^2 - h_2^2)$$

$$K = \frac{2Lq}{(h_1^2 - h_2^2)} = \frac{2 \times 375 \text{ ft} \times 40 \text{ gal / day / ft}}{(5^2 - 4.5^2)} = 6316 \frac{\text{gal}}{\text{day} \times \text{ft}^3}$$

$$= 6316 \frac{0.16046 \text{ ft}^3}{\text{day} \times \text{ft}^3} = 1013 \text{ ft / day}$$

$$(h(x))^2 = h_0^2 - \frac{x}{L}(h_0^2 - h_L^2)$$

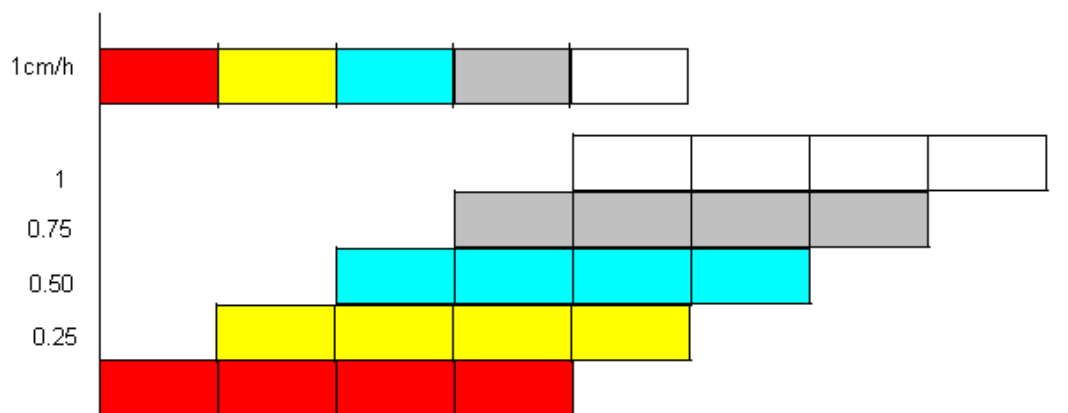
$$h(x) = \left(h_0^2 - \frac{x}{L}(h_0^2 - h_L^2) \right)^{1/2}$$

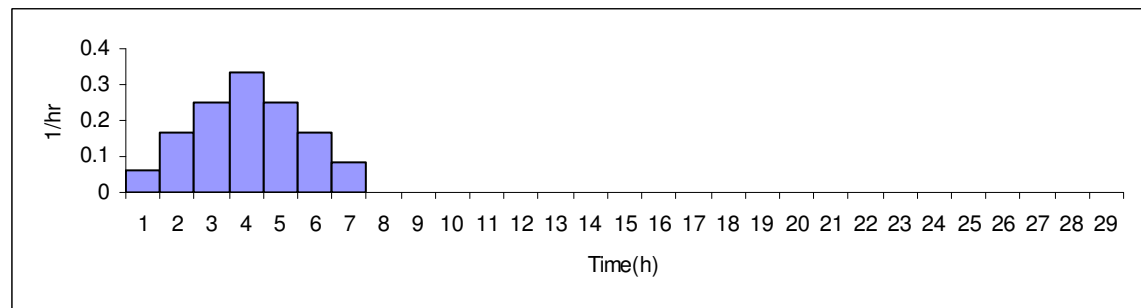
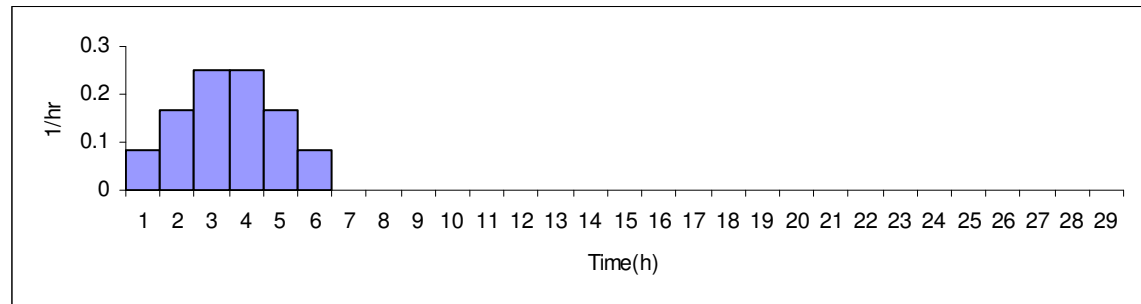
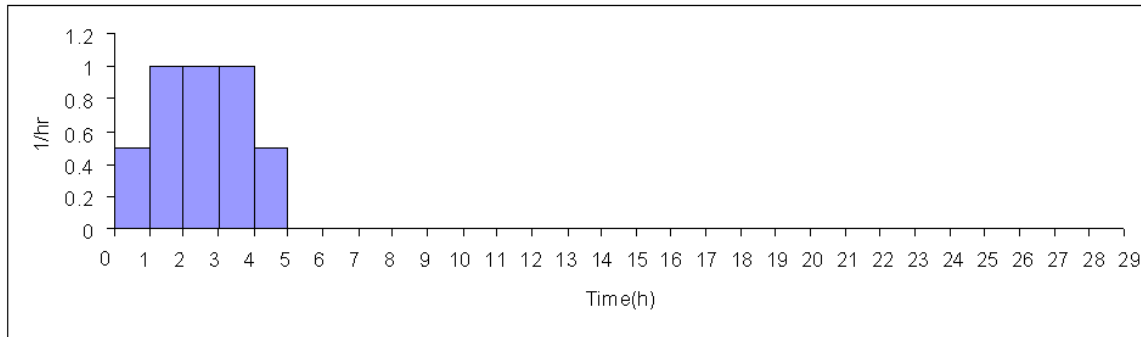
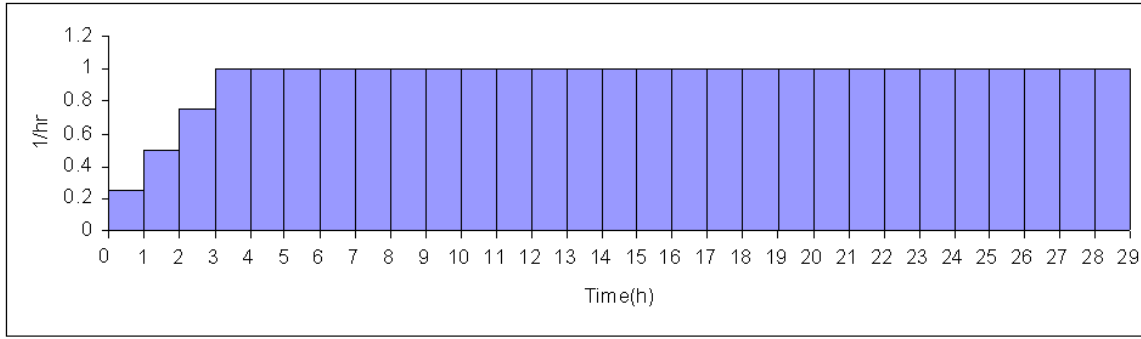
$$h(100 \text{ ft}) = \left(5^2 - \frac{100}{375}(5^2 - 4.5^2) \right)^{1/2} = 4.87 \text{ ft}$$

$$h(200 \text{ ft}) = \left(5^2 - \frac{200}{375}(5^2 - 4.5^2) \right)^{1/2} = 4.73 \text{ ft}$$

$$h(300 \text{ ft}) = \left(5^2 - \frac{300}{375}(5^2 - 4.5^2) \right)^{1/2} = 4.60 \text{ ft}$$

PROBLEM 3





PROBLEM 5

<u>Land use</u>	<u>Soil class</u>	<u>CN</u>	<u>Percentage</u>
residential (1/4-acre lots)	<u>A</u>	<u>61</u>	<u>20%</u>
residential (1/4-acre lots),	<u>B</u>	<u>75</u>	<u>20%</u>

streets and roads paved with curbs and storm sewers	<u>A</u>	<u>98</u>	<u>5%</u>
streets and roads paved with curbs and storm sewers	<u>B</u>	<u>98</u>	<u>5%</u>
commercial and business	<u>A</u>	<u>89</u>	<u>5%</u>
commercial and business	<u>B</u>	<u>92</u>	<u>5%</u>
Industrial	<u>A</u>	<u>81</u>	<u>10%</u>
Industrial	<u>B</u>	<u>88</u>	<u>10%</u>
Open spaces	<u>A</u>	<u>49</u>	<u>10%</u>
Open spaces	<u>B</u>	<u>69</u>	<u>10%</u>

$$CN = 0.2 \times 61 + 0.2 \times 75 + 0.05 \times 98 + 0.05 \times 98 + 0.05 \times 89 + 0.05 \times 92 + 0.1 \times 81 + 0.1 \times 88 + 0.1 \times 49 + 0.1 \times 69 = 74.75$$

$$S = 1000 / CN - 10 = 3.3779$$

$$V_Q = P - S \left(1.2 - \frac{S}{P + 0.8S} \right) = 10 - 3.37 \left(1.2 - \frac{3.37}{10 + 0.8 \times 3.37} \right) = 6.88 \text{ in}$$

PROBLEM 6

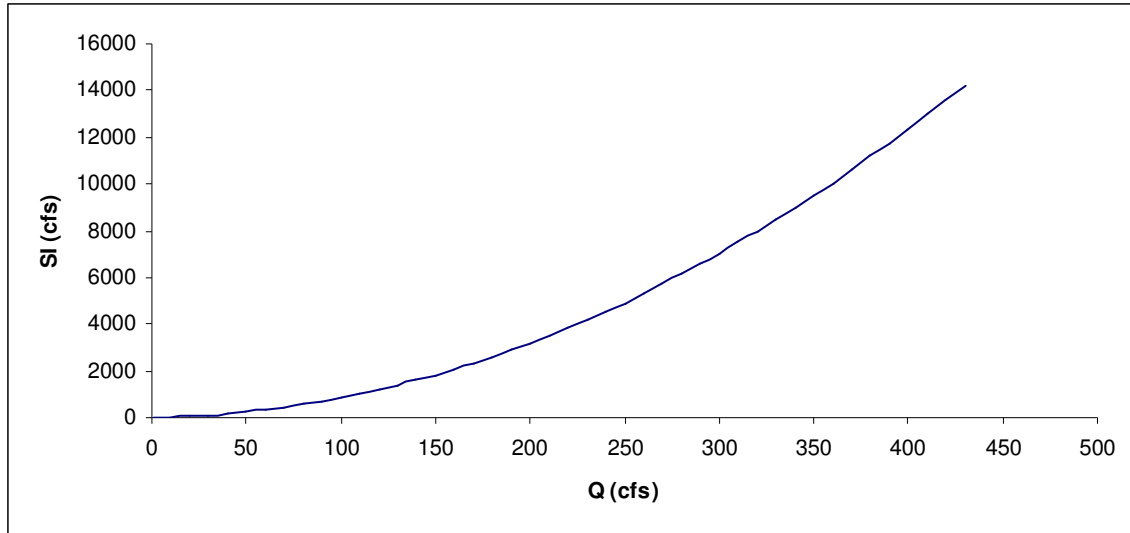
$$s = 100 \times 70 \times h$$

$$Q = CA \sqrt{2gh} \Rightarrow h = \frac{1}{2g} \left(\frac{Q}{CA} \right)^2$$

$$S(Q) = \frac{7000}{2g} \left(\frac{Q}{CA} \right)^2$$

$$SI(Q) = \frac{2S(Q)}{\Delta t} + Q = \frac{2 \times 7000}{2 \times 32.13 \times 3600} \left(\frac{Q}{0.6 \times 3 \times 0.5} \right)^2 + Q$$

$$SI(Q) = 0.074714Q^2 + Q$$



I_i	$I_i + I_{i+1}$	$\frac{2S_i}{\Delta t} - Q_i$	$\frac{2S_{i+1}}{\Delta t} + Q_{i+1}$	Q_{i+1}	Q_i
30	60	0	60	22.5	
30	90	15	105	31.5	22.5
60	180	42	222	48.3	31.5
120	360	125.4	485.4	74.1	48.3
240	660	337.2	997.2	109	74.1
420	870	997.2	1867.2		109
450					

PROBLEM 7

Time (min)	5 min UH	0.6*UH	1.5*UH	0.9*UH	Total
0	12	7.2			7.2
5	28	16.8	18		34.8
10	25	15	42	10.8	67.8
15	15	9	37.5	25.2	71.7
20			22.5	22.5	45
25				13.5	13.5

